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The Malagasy species of Pseudogaurax Malloch (Diptera: Chloropidae), and notes on some African species

by

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SYNOPSIS

Four species of *Pseudogaurax* from Malagasy are described, and a key provided for their identification. The taxonomic range of the chloropid spider-egg parasites and predators is discussed briefly. *P. longicornis* Sabrosky and *P. dissimilipes* (Malloch) are recorded from Nigeria and the marked intraspecific variation noted.

INTRODUCTION

In a family that is predominantly phytophagous in its larval stages, the larvae of *Pseudogaurax* Malloch show a most interesting predaceous habit, preying upon the contents of arachnid and mantis egg-cases.

As a result of their unusual life-histories, the few African species have received a considerable amount of attention from taxonomists. Sabrosky published two papers concerned with the genus, the first (1945) clarified the status of the species previously described into *Gaurax* and *Pseudogaurax*, listed the known species and provided a key to the Ethiopian species. The second paper (1946) described a new species, and further species were described in his work on the Ruwenzori fauna (1951), which remains the only recent revisionary work on the Ethiopian Chloropidae. Séguy (1951) modified Sabrosky's key to include Sabrosky's later species and included a new species from the Malagasy Republic, the first species to be recorded from the sub-region.

Recently I obtained a large number of specimens of an interesting new species, reared from the egg-cases of the giant orb-web spider *Nephila madagascariensis*. Due to its important role as a predator of the spider, and the need to refer to the species by name in research reports, the species is being described here. Dr C. W. Sabrosky generously donated a further three undescribed Malagasy species, unfortunately all three based on single specimens, two of which, being distinctively marked, are described here. Mr J. C. Deeming provided most interesting material from Nigeria, containing two previously described species, but showing a very wide range of intra specific variation.

SPIDER-EGG PREDATION AMONG CHLOROPIDAE

Representatives of the Acalyptrate families Drosophilidae and Chloropidae are reported as developing in the egg-masses of spiders. The drosophilid *Titanochaeta*, endemic to the Hawaiian Islands, is predaceous as a larva, on the eggs of Thomisid spiders (Wirth 1952) but, apparently, is the only genus in the family with this specialized type of life-history. There are, however, a number of genera of chloropids in addition to *Pseudogaurax*, and it is on representatives of this family that I intend to concentrate.

It is not known whether all species of the four main genera concerned with egg predation. *Pseudogaurax*, *Gaurax*, *Tricimba* and *Oscinosoma*, are predators of specific spider hosts, but there is a high probability that true host specificity occurs in the first three genera, although not in all species.

The question of parasitism or predation arises among those species developing within an egg-mass. Kaston & Jenks (1937) observed that the chloropid larvae do not complete their development within a single egg and, as such, must be considered as predators.

There have been a number of detailed accounts of the life-histories of various species of spider-egg predators. Of particular note are: Kessel & Kessel (1937), Kaston & Jenks (1937) and a particularly fine paper by Hickman (1971), in which six Australian species are described in detail.

One of the species described in this paper, *Pseudogaurax coyleae*, was reared from the eggs of the giant orb-web spider, *Nephila madagascariensis*, and it was apparent from the data supplied with the specimens that this species has a very marked effect on the spider populations. In three instances out of five, no spiderlings hatched from the egg-cases; presumably predation was complete. From one case, 245 flies hatched and no spiderlings survived; from another 74 flies and 193 *Nephila* developed (Coyle pers. comm.). It would appear that if the developing spiders are sufficiently advanced in their development they are immune to the predatory actions of the fly larvae. It is not known if the spiderlings are able to prey upon the fly larvae should they reach maturity first.

Genus PSEUDOGAURAX Malloch

Pseudogaurax Malloch, 1915: 159. Type-species: *Gaurax anchora* Loew, 1866, by original designation.

Generic diagnosis:

Antennae large, segment III reniform to elongate, arista simple, pubescent to densely haired: frons haired, orbital series well developed, all approximately the same length and strength; ocellar bristles short and cruciate above the ocelli; eyes large, bulbous, and with a dense covering of hair-like bristles, with the long axis vertical; cheek narrow; palpi elongate, extending beyond the epistoma.

Thorax, typically, yellow with black or dark brown markings in the form of patches or vittae, densely haired, the latter often arising from shallow pits; typically, 1 humeral, 1 + 2 notopleurals, 1 supra-alar, 1 dorsocentral and 1 prescutellar bristle. Scutellum elongate, apical bristles adjacent and, usually, cruciate at their apices, lateral apicals when present parallel to apicals. Wing membrane hyaline, densely microtrichiate, second costal section usually as long as, or longer than, the first section; marginal cell long.

With the exception of the elongate scutellum, 1 + 2 notopleurals, and the reniform third antennal segment, characters not always present in typical forms, there are no reliable characters that delimit *Pseudogaurax* from *Gaurax* and related groups. Taken in combination, typical species may be assigned satisfactorily to a genus. Some species could, however, be placed in either genus, and the problem remains as to whether the two genera *Pseudogaurax* and *Gaurax* can be delimited on a world basis. In each of the major zoogeographical regions there has been major development of one or the other of the genera in the *Gaurax/Pseudogaurax* group. In the Neotropical Region, the species assigned to *Pseudogaurax*, with the possible exception of *P. pallipes* (Duda), appear to form a monophyletic group. However, in other regions, particularly in the Ethiopian Region, the species of *Pseudogaurax* vary considerably, and may represent the results of convergence in certain characters, e.g. antennal and scutellar shape, in species from quite distinct genera. This problem is insoluble until the genera are more satisfactorily defined using a combination of external morphological characters and structures of the male and female genitalia.

Key to the Malagasy species of *Pseudogaurax*

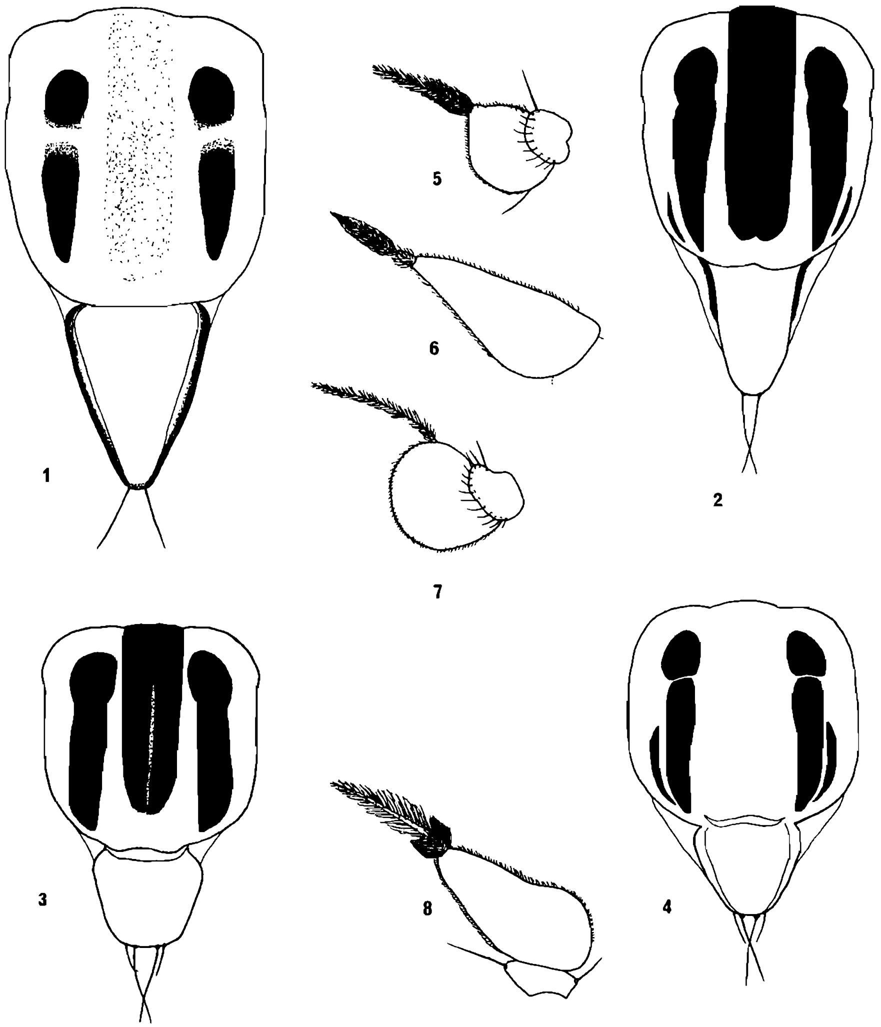
1 — Sombre species, no discernible mesonotal pattern, mesonotal disc black, grading into pale brown on the humeri and notopleura; 1 + 1 notopleural bristles; scutellum dark basally, pale apically . . . . **sp. A.**
— Extensively yellow species, mesonotum with a distinctive black pattern; scutellum yellow, sometimes darkened laterally but never basally . . . 2
2 — Median mesonotal bands well developed, black or dark brown . . . 3
— Median mesonotal bands pale brown or reduced completely 4
3 — Hind tibiae and tarsi extensively darkened; antennal segment III elongated (Fig. 6); scutellum brown laterally over basal half . . . **hemicillis** sp. n.
— Hind tibiae darkened only on the middle third, apical two tarsal segments darkened; scutellum uniformly yellow; antennal segment III reniform (Fig. 5) . . . . **stuckenbergi** sp. n.
4 — Large blackish-brown patch on the mesopleuron; scutellum yellow . . . **mantivorus** Séguy
— Pleural sclerites without dark markings; scutellum yellow with brown lateral areas up to, and including the apex . . . . **coyleae** sp. n.

Pseudogaurax coyleae sp. n.

Male, female:

Head, pale yellow; antennae as in Figure 8, segment III darkened apically, arista flattened and densely haired, black. Ocellar triangle polished, translucent and with a number of pale hairs along its margins; ocellar mound black. Frons microscopically crenulate with numerous scattered pale hairs. Frontal hairs pale anteriorly, becoming stronger and darker posteriorly and on frons. Postvertical and vertical bristles orange-yellow. Face and palpi yellow, latter with a series of pale ventral bristles along their length. Buccae silvery-yellow, narrow.

Thorax, pale yellow, except for the mesonotal pattern (Fig. 1), mesonotal setulae dense, pale laterally, darker on the disc and posteriorly. Humeral bristle small 1 + 2 notopleurals, 1 postalar all yellow; 1 dorsocentral and small postalar dark. Scutellum elongate, scutellum: mesonotal ratio 0,7, shining yellow, uniformly covered with pale setulae, blackish brown laterally from base to apex; scutellar bristles pale, long, scutellars: scutellum ratio 0,4, and divergent (Fig. 1). Legs predominantly yellow; fore-tibia and tarsi, and hind tibia over the basal $\frac{2}{3}$, darkened. Wing membrane hyaline, with a uniformly dense covering of microtrichia; veins strong, dark brown; 1st costal section 1,14 mm long, greater than length of second section, 1st: 2nd



Figs 1–8. Thoracic patterns, dorsal view, 1. *Pseudogaurax coyleae* sp. n.; 2. *P. hemicillus* sp. n.; 3. *P. stuckenbergi* sp. n.; 4. *P. mantivorus* Séguy; segment III and arista of antenna; 5. *P. stuckenbergi*; 6. *P. hemicillus*; 7. *P.* sp. A.; 8. *P. coyleae*.

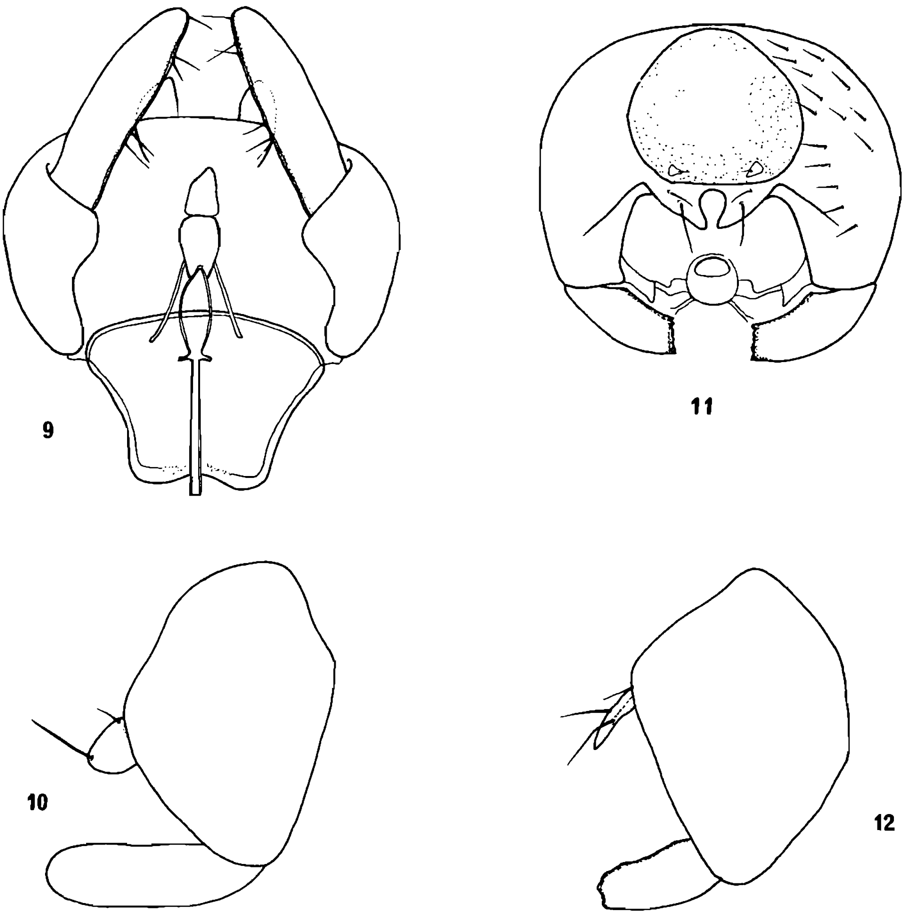
costal section, 1,1; 1st longitudinal vein entering costa almost half-way along wing; 3rd and 4th longitudinal veins converging apically. Wing length, 3,3 mm.

Abdomen, orange-brown, darker posteriorly; a rounded pale area extending medially over the first three segments. Male genitalia as in figs 11, 12.

Holotype ♂, MALAGASY, Fort Dauphin (coll. A. Coyle), emerged egg-case *Nephila madagascariensis* Vinson, In B.M. (N.H.).

Paratypes, 48 ♂, 43 ♀, same data as holotype, over 300 specimens preserved in ethyl alcohol, emerged 6.x to 25.xi.74. Series also in U.S.N.M., Natal Museum and University Museum, Lund, Sweden.

I have pleasure in naming this species in honour of the collector Miss A. Coyle.



Figs 9–12. Male genitalia, 9. *Pseudogaurax mantivorus*, postero-ventral view; 10. lateral view; 11. *P. coyleae*, postero-ventral view; 12. lateral view.

Pseudogaurax hemicillus sp. n.

Although the type specimen is damaged, the fore legs are missing, this striking species is easily recognizable by reason of its antennal shape (Fig. 6), and mesonotal pattern (Fig. 2). The mesonotal pattern is similar to that of *P. stuckenbergi*, but the antennae are quite distinct. In this species the third antennal segment is elongated as in *P. longicornis* Sabrosky. The following description emphasizes points of difference from *P. stuckenbergi*.

Female:

Head, yellow, darkened on the ocellar prominence, laterally on the ocellar triangle and dorsally on the third antennal segment. Palpi elongate, extending anteriorly far beyond the mouth edge; eye hairy, but neither as densely nor as regularly as in *P. stuckenbergi*.

Thorax, yellow; black mesonotal pattern as in Figure 2, sides of scutellum brown only over basal half. Pleura with angular patch, almost triangular, on the mesopleuron; blackish-brown area on the ventral area of the sternopleuron, and an elongate mark on the metasternum. Colour of the mesonotal bristles inconsistent between the two sides. The anterior notopleural is pale on both sides, the posterior pair is totally dark on the left, and the dorsal bristle only is dark on the right side; other bristles are dark brown or black. Scutellum: mesonotal ratio, 0,52, scutellars: scutellum ratio, 0,4. Halteres pale yellow on knob, reddish-yellow on stem. Fore legs missing, except for coxae and trochanters which are yellow. Middle legs yellow, darkened dorsally at the knee. Hind leg with coxa, trochanter and femur yellow, the latter also darkened at the knees, remainder of leg brown. Glandular area visible only when viewed at an acute angle to the tibia. Wings hyaline, veins dark brown, 2,8 mm in length, 1st costal section 0,9 mm, 1st: 2nd costal section, 1,1.

Abdomen, very similar in coloration to *P. stuckenbergi*, however, the posterior segments are brown.

Holotype ♀, MALAGASY, Tam., Perinet. 5.xii.57. F. Keiser. In Basel Museum.

Pseudogaurax mantivorus Séguy

Pseudogaurax mantivorus Séguy, 1951: 305.

Described by Séguy from an unspecified number of specimens reared from the ootheca of a mantid. The species is most readily recognized by the reduced mesonotal pattern and the relatively short scutellum (Fig. 4).

Séguy gave a full description, but erred in stating that the number of notopleural bristles is 1+1 rather than the typical complement of 1+2.

The following brief diagnosis should enable the species to be recognized.

Male, female:

Head, yellow, darkened only on the ocellar prominence and arista; third antennal segment reniform; palpi moderately long, just reaching the anterior peristomal aperture. All head bristles yellow.

Thorax, predominantly yellow, median mesonotal bands totally lacking, laterals reduced (Fig. 4), only a mesopleural dark brown segment. Scutellum pale yellow, scutellum: mesonotal ratio, 0,65, scutellars: scutellum ratio, 0,7. Legs yellow, fore and hind tibiae and tarsi brown, glandular area of hind tibia silvery-white. Wings hyaline, veins dark brown, 2,6 mm in length, 1st costal section 0,72 mm, 1st and 2nd costal section 0,8 mm.

Abdomen, yellowish with a pair of diffuse lateral bands and a rather diffuse median reddish-brown band. Male genitalic segments yellow, male genitalia as in Figures 9, 10.

Material seen: only the paratype series of 5 specimens, 2 ♂, 3 ♀, from the Museum National d'Histoire Naturelle, and bearing the following labels: Tsimbazaza, Tananarive; I.S. Madagascar 620. Ootheques de Mantes; *Pseudogaurax mantivorus* Cotype, 1950, E. Séguy vid.

Pseudogaurax stuckenbergi sp. n.

In thoracic pattern this species resembles *P. longicornis* Sabrosky, from Uganda, but the antennal form is quite distinct. The head, scutellum, legs and pleura are bright yellow with intensely black markings on the thorax; abdominal segments 2–5 chocolate brown.

Female:

Head, yellow, darkened only on the ocellar triangle and dorsally on antennal segment three. Dorsal bristle on antennal segment two and the orbital bristle series dark brown, the remainder yellow or yellowish brown. Frons with a dense scattering of hairs, ocellar triangle bare. Eyes uniformly haired. Nine bristles in the orbital series; ocellars erect and cruciate; postverticals and outer verticals strong, inner verticals vestigial. Palpi just extending beyond the anterior epistomal edge.

Thorax, yellow, notum and scutellum covered with pilose punctures, pattern as in Figure 5. Humeral bristle weak, 1+2 notopleurals, supra and intra-alars present, latter weak, single pair of weak *dc*'s; all bristles dark. Scutellum lemon-yellow, apical bristles dark, sub-apicals pale, scutellum: mesonotal ratio, 0,44, scutellars: scutellum ratio, 0,7. Pleura glabrous yellow except for a large rounded black patch on the antero-ventral edge of the mesopleuron, and a reddish-brown ventral region to the sternopleural. Elongate dark brown mark on the metasternum above the hind coxa. Legs yellow except for the pale brown foretarsi; hind tibia brownish over the median third on the antero-dorsal face, apical two tarsal segments darkened. Halteres pale reddish-yellow. Wings hyaline, veins pale brown, 3,1 mm in length. 1st costal section, 0,92 mm, 1st: 2nd costal section 0,8 mm.

Abdomen, segments one and two yellowish, dark brown laterally on segment two and totally so on segments 3–5, remaining segments pale yellow.
Holotype ♀, MALAGASY Centre, Plateau Soaindrana 2 060 m, Andrigitra-Ambalavao, 14–17.i.58 (B. Stuckenberg). In Paris Museum.

Pseudogaurax sp. A

The most aberrant of the four Malagasy species in lacking the characteristic black and yellow mesonotal pattern. Dark areas extend over most of the notum, grading into orange-brown on the humeri and notopleura, and apically on the scutellum. Its sombre coloration, well-developed inner vertical bristles, single posterior notopleural bristle and only moderately developed scutellum throw some doubt on its correct generic placement, however, in the absence of information on its life-history, it is best assigned to *Pseudogaurax*. In view of the lack of pattern, and the sex of the single specimen, it is thought unwise to formally name this species at this time.

Female:

Head, anterior frons orange-brown, darkening posteriorly and on vertex; greyish-yellow face and pale grey dusted buccae. Antenna intensely orange with short tomentum segment III characteristically reniform, with a short and uniformly long-haired arista (Fig. 7). Vibrissa and buccal bristles pale, all other bristles on head, thorax and abdomen black. Frons covered with relatively long dark setulae except in median line; short orbital bristles hardly distinguishable among the setulae. Ocellar mound black with grey lateral dusting, inner and outer verticals and postverticals well developed. Eyes noticeably more bristly than in other Malagasy species.

Thorax, notum predominantly black, grading to pale orange-yellow on the notopleuron and orange-brown on the humerus. The notum uniformly dusted with grey and with the mass of setulae arising from small pits on the darker areas. Normal thoracic bristle complement of humeral, 1 + 1 notopleurals, supra and postalar, and a single dorsocentral. Scutellum is dark at the base grading to pale yellow at the apex; scutellum: mesonotal ratio, 0,55, uniformly haired, and with an apical pair of convergent bristles, and two additional pairs of lateral, weak bristles, scutellars: scutellum ratio, 0,6. Pleura orange-brown anteriorly, heavily grey dusted, dorsally, on the meso- and pteropleura, darkening ventrally to the shining black sternopleuron, the latter with a group of pale hairs on its dorsal half. Legs orange-brown, fore coxae pale on their internal faces, shining dark brown basally. All femora darkened, increasingly so from the fore to hind legs; hind femora and tibia, except apically, blackish-brown; all tarsi orange-brown. Halteres pale orange-yellow. Wings, 3,5 mm in length, 1st costal section 1,0 mm, 1st: 2nd costal section 0,8; 1st longitudinal vein enters costa before the mid-point of the wing.

Abdomen, dark reddish-brown, lightly grey dusted, and with a uniform clothing of short setulae, the latter a little longer on the posterior and lateral regions of the segments. First two segments with a large median, and small lateral, orange-yellow areas. Last two abdominal segments dark; 'ovipositor' pale reddish-yellow.
Material seen: 1 ♀, MALAGASY, Ambatotitorahana, km 303, rte. de Mananjary. In Institute Scientifique, Malagasy Republic.

NOTES ON TWO SPECIES FROM THE AFRICAN MAINLAND

In direct contrast to the situation to be found in Malagasy, the species of *Pseudogaurax* from the African mainland show considerable individual and geographical variation in coloration. These variations are particularly well exhibited in Nigerian material that I received from Mr J. C. Deeming recently, and are described below.

Pseudogaurax dissimilipes (Malloch)

Gaurax dissimilipes Malloch, 1931: 422. Type locality, Sierra Leone.

This species is redescribed, as the original series from Sierra Leone described by Malloch was teneral and damaged. The following description of the typical form is based on the type series and material from Western Nigeria.

Male, female:

Head, pale yellow, except for darker yellow antennae, black arista and shiny black ocellar prominence. Antennae, reniform segment III, slightly attenuated dorsally and with the apical section of the arista broadened by dense blackish-brown hairs. Eyes uniformly hairy; 10–12 orbital bristles of same size and coloration as frontal bristles; ocellar triangle pale yellow and glabrous. Buccae and palpi pale yellow, the latter just extending beyond the epistoma.

Thorax, pale yellow, except for a dark brown bar on the ventral edge of the mesopleuron, and darkened fore and hind tibiae and tarsi; all thoracic bristles white or pale yellow. Mesonotum sub-shining, with a covering of short hairs; notopleural bristles 1 + 2; dark lateral bands of mesonotal pattern arising from just posterior to humeral prominences and tapering posteriorly. Scutellum pale yellow with one pair of strongly cruciate apical bristles, and 2–3 pairs of weaker lateral bristles.

Mesopleuron with a dark brown diagonal bar. Legs yellow, except for the fore tibiae and tarsi which are dark brown, and the hind tibiae in which only the ventral surface and the glandular area are yellow, the remainder and the tarsi are brown; tarsal claws are very reduced on all legs. Wings 3,6 mm in length, 1st: 2nd costal section ratio, 1,1; wing membrane hyaline and the veins pale brown except for the costa which is dark brown over the apical $\frac{2}{3}$; halteres pale yellow.

Abdomen, dark brown except for a pale area, medially, on the first three visible segments; tergal hairs whitish, more apparent laterally, sparse on the median section, genitalia as in figs 14, 15.

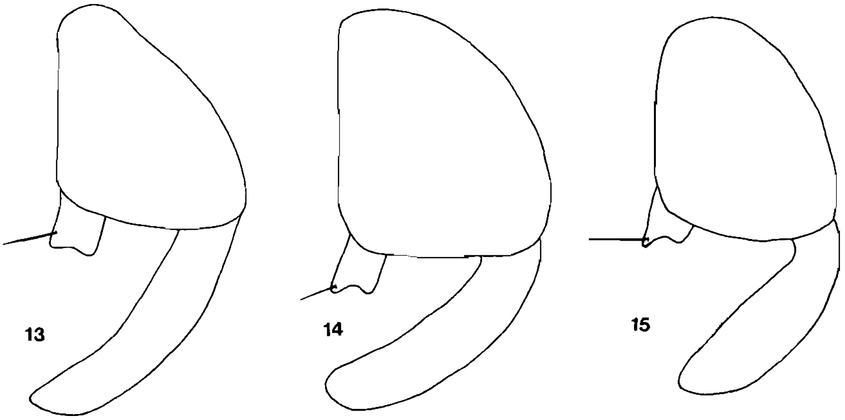
Material studied; in addition to the type series studied by Malloch, I have seen the following Nigerian material.

No. 6123, W. NIGERIA, Illaro Forest, 2.ii.1975 (M. A. Cornes), 1 ♀; No. 2669, 6,5 km NW of Agege, Lagos State, 30.xii.1973 (M. A. Cornes), 1 ♂; No. 3308, 19.i.1974 (M. A. Cornes), 1 ♀; No. 5509, 6.x.1974 (M. A. Cornes), 1 ♀; No. 1334, 14.iv.1973 (M. A. Cornes), 2 ♂; No. 5505, Lagos State, Ikoradu, 29.ix.1974 (M. A. Cornes), 1 ♂; No. 4077, Illaro Forest, 24.iii.1974 (M. A. Cornes), 1 ♂; 6,5 km NW. of Agege, 11.iii.1973 (M. A. Cornes), 1 ♂.

This form probably represents the southern variety from areas of relatively high humidity.

Variety 2, mesonotum totally pale, but the typical pattern both on the thorax and abdomen is discernible as yellowish-orange areas in contrast to the pale yellow ground colour. The male terminalia differ marginally from that found in specimens which are externally very much closer in colour to the typical form (Fig. 15). N. Nigeria, Nr. Mokwa, Zugurma, 26.xii.1971 (J. C. Deeming), kurmi, 4 ♂, 2 ♀; Lagos State, 6,5 km NW of Agege, 19.i.1974, 1 ♂; No. 857, 11.iii.1973, 1 ♂; No. 4037, Illaro Forest, 24.iii.1974 (M. A. Cornes), 1 ♀.

Although the data of the typical form suggests a special distribution, that of the pale variety does not, and it probably represents nothing more than an extreme variation within the species. It is possible that further collecting may show this to



Figs 13–15. Lateral view of male terminal segment, 13. *Pseudogaurax brunneus* sp. n.; 14. *P. dissimilipes* (Malloch); 15. extreme form.

be a species complex, perhaps allied to different host specificity. The following new species may be a member of the complex, as it is certainly very closely related to *P. dissimilipes.*

Pseudogaurax brunneus sp. n.

With the exception of the dark brown mesonotum and slight differences in the shapes of the telomeres and cerci, this species closely resembles *P. dissimilipes* (Malloch).

Male:

Head, as for *P. dissimilipes*, except for the dark brown ocellar triangle.

Thorax, mesonotum dark brown, pale yellow on the humeral prominence; scutellum yellow to brownish-yellow; pleura dark brown except for area from humerus to base of fore coxa, and sternopleuron in one specimen. Legs and wings as in *P. dissimilipes*, wing length 2,5 mm.

Abdomen, dark brown, except for median pale area on first three visible tergites; terminal segment yellow; telomeres longer and more slender than in *dissimilipes*, apex of anal cercus less projecting (Fig. 13).
Holotype ♂, No. 6058, W. NIGERIA, Illaro Forest, 2.ii.1975 (M. A. Cornes). In BM(NH). Paratype ♂, No. 3144, W. Nigeria, Illaro Forest, 13.i.1974 (M. A. Cornes). In coll. Cornes.

Pseudogaurax longicornis Sabrosky

Pseudogaurax longicornis Sabrosky, 1945: 47. Type-locality, Uganda.

A series of three females of a species from N. Nigeria at first appeared to be a new species near *P. longicornis* Sabrosky. However, a study of the thoracic pattern as delimited by both contrasting yellow areas, and the yellow and black pattern forced me to conclude that the Nigerian specimens are West African colour variants of the species described from Uganda. The main point of difference is the reduced broad median vitta in the Nigerian specimens. The vitta is reduced to two dark patches on the scapular ridge with pale brown extensions for a short distance posteriorly; the lateral vittae are also reduced both in area and colour intensity. On Ugandan *longicornis*, the edges of the scutellar triangles are delimited by a series of short bristles arising from the pale brown area; the brown area is absent from the Nigerian specimens although the bristles are present. Sabrosky noted that there is sexual dimorphism with relation to the antennal shape, segment III in the female is considerably more elongate than in the male; the third segment in the Nigerian specimens is even more slender than in the type series.
Material studied: N. NIGERIA, Zaria, Samaru, 2.vi.1971, 24.vi.1971, 28.v.1972 (J. C. Deeming), all 3 females.

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